In this lab we are going to explore Natural Selection in two ways. First, we are going to look at five types of “birds” and how an environmental change would determine their survival. Next, we will look at the effect the invading species has on our “bug” population and its survival.

**Part I: Bird Transplantation**  
You are on an island in the pacific. There are 5 types of birds: Black Beaked Finch, Hook Nose Nigemni, Flat Billed Warbler, Thin Beaked Silverback, and the Narrow Billed Crimson on your island and they all live together harmoniously. The island is just the right size to support the bird population in terms of food, territory and other factors that are key to survival.

One day however, a large tropical storm blows in. Six birds of each species are blow away to an island where there was no bird population. On this island, there were only bugs for food. The territory is suitably large enough and other factors are fitting for the bird’s survival, food is the only potential problem.

Each of the three competing species of bugs had its own characteristics that may or may not be important. There was the White Beetle, Red Scarab, and the Speckled Ho-Hum, each of them eatable by any of the six species of birds. The island the bugs live on is a vast beach of pure white silica sand.

**Pre-Trial Questions**

1. What effect could the color of the bugs have on the bird’s ability to hunt them?
2. What characteristics of the different birds do you think is important to their survival on the new island?
3. Make a prediction on which bird(s) will be successful and which will not survive on the new island. What factors did you use to determine fitness?

**Procedures**

At each lab station you have tools (scissors, tweezers, tongue depressors, test tube holders and bend nose forceps), each of which represents each type of bird. Also, there is a tray which represents the island. The beans represent the bugs that inhabit the island. Follow each step to find which bird is best suited for this new environment.

1. Delegate members in your group to each of the following tasks: timer, recorder, counter, and bird imitator. These jobs will change with each trial, so everyone will get to do each task. (One group member may just be an observer depending on your group’s size.)
2. After each task has been assigned, the trial is ready to begin. Start the timer and let it go for 45 sec. The person who is imitating the bird should, during this 45 sec, grab as many bugs as possible with the imitation beak. The counter is in charge of counting the bugs and making sure they don’t disappear (get lost). At the end of the trial, the recorder gets the data to enter into the table from the counter.
3. For this trial there should be ten of each type of bug on the island.
4. The trial is then repeated with new people at each task. Each bird will get two trials. This makes for a total of ten trial runs.

**Data Table 1**

|  |  |  |
| --- | --- | --- |
| **Species of Bird** | **# of Bugs Eaten** | |
| **Trial 1** | **Trial 2** |
| Black Beaked Finch |  |  |
| Hook Nose Nigemni |  |  |
| Flat Billed Warbler |  |  |
| Thin Beaked Silverback |  |  |
| Narrow Billed Crimson |  |  |

**Post-Trial Questions**

1. Which bird was the most successful? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Least successful? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Why was each bird successful/not successful?
3. Do your predictions match what you found? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ If not, what factors did you need to consider for the survival of the birds? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part II: What About The Bugs?**

In the first portion of this lab we looked at the survival of our birds, but what about our bugs? Can these birds live on the island and find equilibrium with the bugs? If the bugs die off, can our birds survive?

In this scenario, we see that the birds depend on the bugs for survival. We know the bugs do not need the birds to survive; they were doing just fine pre-bird infestation. The bugs are what we call a latch key species. A latch key species can survive on its own, but a latch key dependent species may not be able to.

**Pre-Trial Questions**

1. Describe the external properties of the bugs
2. Describe the habitat of the island the bugs inhabit.
3. What properties would make a bug more suitable for survival on the island? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Explain your reasoning for this answer. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Prediction time: Which bugs will survive? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Which will not? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Each bug is capable of producing ten times its own number for the next generation. That is to say, if there are ten bugs, the next generation will have a hundred bugs. For each species survival, there needs to be a minimum of two bugs.

Procedure

1. From Part I, select the best-fit bird for survival on the island. This is the bird that will be used for the entire trial. We will not be changing birds.
2. Each bug number will be doubled. This means that each group needs ten more of each species of bug.
3. Delegate the same duties (timer, counter, etc.). in this trial, we are trying to see how fast the bird can eat. This trial is all about speed. Go as fast as possible and eat as many bugs as possible.
4. Each trial will last 45 seconds. Everyone will get two chances to be the bird in this trial. This means that if you are in a group of five there will be ten trials.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| |  |  |  |  | | --- | --- | --- | --- | | **Trial 1** | | | | |  | **White** | **Red** | **Speckled** | | **# Of Bugs Eaten** |  |  |  | | **# Of Bugs Remaining** |  |  |  | | **Do the Bugs Survive?** |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | | **Trial 2** | | | | |  | **White** | **Red** | **Speckled** | | **# Of Bugs Eaten** |  |  |  | | **# Of Bugs Remaining** |  |  |  | | **Do the Bugs Survive?** |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | | **Trial 3** | | | | |  | **White** | **Red** | **Speckled** | | **# Of Bugs Eaten** |  |  |  | | **# Of Bugs Remaining** |  |  |  | | **Do the Bugs Survive?** |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | | **Trial 4** | | | | |  | **White** | **Red** | **Speckled** | | **# Of Bugs Eaten** |  |  |  | | **# Of Bugs Remaining** |  |  |  | | **Do the Bugs Survive?** |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | | **Trial 9** | | | | |  | **White** | **Red** | **Speckled** | | **# Of Bugs Eaten** |  |  |  | | **# Of Bugs Remaining** |  |  |  | | **Do the Bugs Survive?** |  |  |  | | |  |  |  |  | | --- | --- | --- | --- | | **Trial 5** | | | | |  | **White** | **Red** | **Speckled** | | **# Of Bugs Eaten** |  |  |  | | **# Of Bugs Remaining** |  |  |  | | **Do the Bugs Survive?** |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | | **Trial 6** | | | | |  | **White** | **Red** | **Speckled** | | **# Of Bugs Eaten** |  |  |  | | **# Of Bugs Remaining** |  |  |  | | **Do the Bugs Survive?** |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | | **Trial 7** | | | | |  | **White** | **Red** | **Speckled** | | **# Of Bugs Eaten** |  |  |  | | **# Of Bugs Remaining** |  |  |  | | **Do the Bugs Survive?** |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | | **Trial 8** | | | | |  | **White** | **Red** | **Speckled** | | **# Of Bugs Eaten** |  |  |  | | **# Of Bugs Remaining** |  |  |  | | **Do the Bugs Survive?** |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | | **Trial 10** | | | | |  | **White** | **Red** | **Speckled** | | **# Of Bugs Eaten** |  |  |  | | **# Of Bugs Remaining** |  |  |  | | **Do the Bugs Survive?** |  |  |  | |

**Post-Trial Questions**

1. Which bugs will be able to survive to the next generation? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Which went extinct? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Did the survival/extinction of each bug coincide with your prediction? Why or Why not?

**Synthesis of Data**

Now that we have done the trails and collected the data, let’s interpret what we found in terms of natural selection.

* What factors influence Natural Selection?
* How does species invasion affect these factors?